AP42 Section:	11.7
Background Chapter:	4
Reference:	33
Title:	*Hydrogen Cyanide Emission Testing, Foseco, Inc., Mt. Braddock Plant, Mt. Braddock, PA*, Hemeon Associates, Inc., Pittsburgh, PA, April 16, 1990.

Commonwealth of Pennsylvania
Environmental Resources
June 19, 1980

Not Ceramics Mfg.

Subject: Source Test Review

To: Data File
FOSECO, Inc.
Mount Braddock, Fayette County

From: Thomas P. Blanca
Air Pollution Control Engineer
Division of Technical Services and Monitoring
Bureau of Air Quality Control

Through: Chief, Source Testing and Monitoring Section

FOSECO, Inc. operates a drying kiln at its facility in Mount Braddock, Fayette County. Aluminum oxide, silicon dioxide and water are mixed to form a slurry. Urethane foam in one and one-half feet squares are dipped into the slurry. The coated foam then enters a drying kiln which is heated at a rate of 275°F per hour until the temperature reaches 752°F at which time the heating rate is slowed to 90°F per hour. The temperature rate is again raised to 275°F per hour until 2300°F is reached and held for two hours and then cooled at 400°F per hour to approximately 1600°F. The resulting ceramic blocks are then taken to a cooling area, allowed to cool overnight and then packaged for shipment. The effluent from the kiln is drawn to an afterburner operating at approximately 1,600°F by an induced draft fan rated at 2,100 acfm. From the afterburner, the effluent is exhausted to the atmosphere through a 13.5 inch I.D. stack having a discharge point approximately 23 feet above grade.

Hemeon Associates, Inc. conducted hydrogen cyanide emissions testing for compliance purposes in the stack serving the drying kiln. Mr. Dick Murray of the Greensburg District Office observed the testing program. The tests were conducted in accordance with the preapproved test protocol and are acceptable to the Department. The calculations are correct and the results appear to be valid.

The following was extracted from the test report:

Run No.	1	2	3
Kiln Temperature, °F	400-750	840-1020	2300
Hydrogen Cyanide Concentration, PPMV	0.458	0.023	ND
Hydrogen Cyanide Mass Emission Rate, lb/hr	0.004587	0.0002106	ND

ND = None Detected

cc: Joseph Penza, Pittsburgh Regional Office
Dick Murray, Greensburg District Office
28-309-042
EPA/RSL
Reading File
Doug Leuher

TPBerjr

HEMMER ASSOCIATES INC.

Air Pollution Consulting Engineers
135 Thirty-Sixth Street
Pittsburgh, PA 15201

(412) 683-6100

FAX (412) 683-6104

HYDROGEN CHLORIDE EMISSION TESTING FOSECO, INC. MT. BRADDOCK, PLANT MT. BRADDOCK, PA

Report to:
Mr. Dan Ryan
Foseco, Inc.
20200 Sheldon Road
Cleveland, Ohio 44124

Report by:
Mr. Christopher J. Hickman
Project Manager
Hemmer Associates, Inc.
135 Thirty-sixth Street
Pittsburgh, PA 15201

April 18, 1990

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APPENDICES

1.0 INTRODUCTION

On April 11, 1990, the Hydrogen Cyanide emissions testing was conducted on the Kiln afterburner Stack Gas unit No. 20 at Fosoco, Inc'n. plant in Mt. Braddock, PA. The test program was authorized by Mr. Barry Bittner of Fosoco, Inc. Testing was performed by Mr. John C. Perry and Mr. Russell Lantz of Homeon Associates, Inc. Process coordination was provided by Mr. Orrin Clingan, Jr. of Fosoco, Inc. Observing the testing was Mr. Dick Murray of the PA Department of Environmental Resources.

PURPOSE

The purpose of this compliance test program was to determine the Hydrogen Cyanide emissions from the Kiln Afterburner Stack and its compliance with the PA Department of environmental Resources.

2.0 SUMMARY OF RESULTS

Table No. 1 below represents the hydrogen cyanide emission results from testing the Afterburner Stack at Fonoco, Inc.'s plant in Mt. Braddock, PA.

TABLE NO. 1

Hydrogen Cyanide Emission Results

Date 1990	Sample Location	Test No.	Hydrogen Cyanide Emission	
			PPM a.	Measured lb/hr b.
4-10-90	Afterburner Stack	1	0.456	0.004567
4-10-90	Afterburner Stack	2	0.026	0.0002106
4-10-90	Afterburner Stack	3	0.000	0.000000

a - Parts per million by volume
b - Pounds per hour.

Table No. 2 is a summary of the flue gas parameters.

Table No. 2
SUMMARY OF FLUE GAS PARAMETERS

FOSFLO

TEST NO.	1	2	3
TEST DATA			
Test Date	4/10/90	4/10/90	4/10/90
Static Pres., in.WC	-.56	-.56	-.56
Pitot Readings, rms	1.11	1.22	1.112
Gas Temp., deg.F	530	521	778
Flowmeter Ave.,"WC	1.04	1.22	.748
Gasmeter Av. Temp., deg. F	71	68	76
Sampling Time, min.	120	60	120
Sample Vol., acf	70.65	35.527	60.692
Barom. Pres., in. Hg	29.03	28.9	28.73
Condensate, ml	40	24	54
Desica. Gain, gms	16.7	5.5	12.7
GAS COMPOSITION			
CO2, mole fraction	.015	.015	.015
O2, mole fraction	.19	.19	.19
N2, mole fraction	.795	.795	.795
AREAS			
Stack Diameter, in.	13.5	13.5	13.5
Stack Area, sq.ft.	.9940196	.9940196	.9940196
Nozzle Diameter, in.	.197	.197	.197
Noz. Area, sq.ft.	.0002117	.0002117	.0002117
CALCULATED RESULTS			
Gas, Dry mol. wt.	29.01	29	29
Gas Dens.,lb/cu ft	.075	.075	.075
Sample vol., dry scf	68.5	34.5	57.7
Gas samp., dry lbs	5.14	2.59	4.33
Water in Samp.,lbs	.125	.065	.147
Water Cont. lbs/lb	.024	.025	.034
Water, volume %	3.6	3.9	5.2
Water, weight %	2.3	2.5	3.3
Gas Mol. Wt., Actual	28.59	28.57	28.43
Gas Dens. in stack	.0384	.0385	.0382
Stack Gas, acfm	4900	5200	5600
Stack Gas, lbs/hr	11300	12000	10100
St. Gas, lbs/hr dry	11000	11700	9800
St. Gas, scfm,dry	2440	2602	2180
Percent Isokinetic	109.9	103.9	103.6

3.0 PROCESS & TEST PROGRAM DESCRIPTION

PROCESS DESCRIPTION

Polyurethane foam impregnated with a slurry of ceramic material is fired in a kiln for 17 hours. The impregnated foam is subjected to a scheduled temperature increase which reaches a maximum temperature of 2300°F. The polyurethane foam is destroyed leaving a porous ceramic block which is used by Fosnoc's customers to filter molten aluminum.

The kiln is heated at 275°F per hour until the temperature reaches 652°F - 752°F. It is held at 2300°F for two hours and then cooled at 400°F per hour to approximately 1600°F.

Hydrogen cyanide is released from the foam at 400°F. The kiln is fired by 12 natural gas burners which have a maximum heating input of 3.5 million Btu/hr.

SAMPLING PROCEDURES

Sampling ports were provided at at least eight stack diameters above the draft damper as shown in Figure No. 1.

Samples were taken according to EPA Methods 1 and 2 along two axes of the stack at right angles to each other. EPA Methods 3 and 4 were used for the determination of gas composition and moisture. A Method 5 sampling train was used to perform isokinetic sampling. The impingers contained 0.1N KOH.

Sampling began when the kiln temperature reached 400°F. The first sample was taken for a 2 hour period. Due to severe weather conditions, the second sample was taken for a period of 1 hour beginning about 1 hour after the first sample was completed. The third sample was taken for 2 hours during the holding period after the kiln reached its maximum temperature of 2300°F.

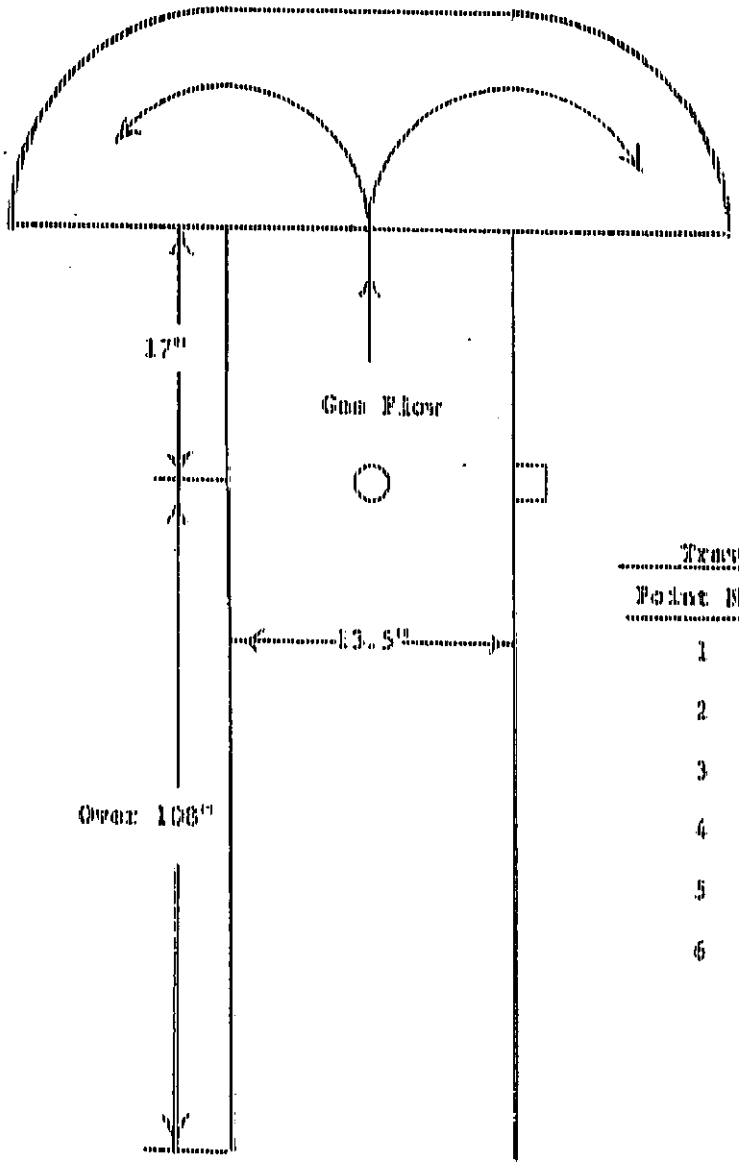
Because of the uncertainty that temperature can be sufficiently controlled to prevent a polymer filter from melting, all three tests were conducted without using a filter. The recovery of HCN was made from the sampling probe, the impingers and the desiccant.

A quartz probe was used for sampling. Velocity and temperature were measured at each sampling point in accordance with customary procedures for EPA Method 5. A minimum of 30 dry standard cubic feet was collected for each sample.

ANALYTICAL PROCEDURES

Analysis was performed by cyanide ion electrode according to procedures of NIOSH Method 7904.

A detailed procedure for EPA Method 5 is located in Appendix B.



2 Ports 90° Apart

6 Points Per Port

12 Points Total

Traverse Point Location

Point Number	Percent of Diameter
1	6.4
2	14.6
3	29.6
4	70.4
5	85.4
6	93.6

Figure No. 1

Kiln Afterburner Stack

New Unit No. 2

Fonseca, Inc. - Mt. Braddock, PA

A. Formulas and Calculations

Remcon Associates, Inc.

Example Calculations for Particulate Emissions

Test No.

1. Volume of dry gas sampled corrected to standard conditions. Note: V_m must be corrected for leakage if any leakage rates exceed L_a.

$$V_{m_{std}} = 17.65 \times V_m \times Y \left[\frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m} \right] =$$

2. Weight of water in flue gas sample (lbs.).

$$Wfg = \left(\frac{\text{(ml condensate + grams desic. gain)}}{453.6} \right) =$$

3. Water vapor concentration (%).

$$Wvc = \frac{(21.5 \times Wfg \times 100)}{(21.5 \times Wfg + V_{mstd})} =$$

4. Dry molecular weight of stack gas.

$$M_d = 0.44\ (\%\ CO_2) + 0.32\ (\%\ O_2) + 0.28\ (\%\ N_2 + \%\ CO) =$$

5. Stack gas density (lbs./dscf).

$$Dg = \left(\frac{Md}{29} \right) \times .0753 =$$

6. Stack gas density at stack conditions (lbs./ft.^{3}).

$$Dgs = .0753 \times \left(\frac{Md}{29} \right) \times \frac{Pb + \frac{Ps}{13.6}}{29.92\ in.Hg} \times \left(\frac{528}{Ts^{\circ}R} \right)$$

7. Molecular weight of stack gas.

$$M_s = M_d\ (1-Wvc) + 18\ Wvc =$$

8. Stack velocity at stack conditions, fps.

$$V_s = 85.49\ Cp \sqrt{\Delta p}\ \text{avg.} \sqrt{\frac{Ts}{P_s M_s}} =$$

9. Actual volumetric flow rate (ACFM).

$$Sf = \frac{1096.7 \times Cp \times \sqrt{\Delta P(RMS)} \times An}{\sqrt{Dgs}} =$$

10. Stack weight flow at stack conditions (lbs./hr.).

Swf = Sf x Dgs x 60 =

11. Gas sample weight (lbs.).

Gsw = Vmstd x Dg =

12. Humidity of flue gas (lbs. of H_2O/lbs. dry gas).

$$Hfg = \left(\frac{Wfg}{Gsw}\right) =$$

13. Stack weight flow on dry basis (lbs./hr).

$$Swfd = \left(\frac{SWf}{1 + Hfg}\right)$$

14. Stack volumetric flow at standard conditions (SCFM).

$$Sfs = \left(\frac{SWfd}{60 \times Dg}\right) =$$

15. Isokinetic sampling rate (I).

$$I = \left(\frac{Vmstd \times As \times 100}{Sfs \times An \times \theta}\right) =$$

16. Weight of particulate (10^{-3} lbs.).

Wp = (Wt_m wt. grams) x 2.2046 =

17. Pounds of particulate per 1000 lbs. of gas (lbs. part./1000 lbs. gas).

$$(Wp/g) = \left(\frac{Wp}{GVw}\right) =$$

Hansen Association, Inc. report of 4/19/00
to Fenco, Inc., Cleveland, Ohio

HCN Emission Calculations

$$\text{PPM of HCN} = \frac{\text{mg of HCN}}{24^{*}} \times \frac{24.5}{\text{M.W.}}$$

Test No. 1

$$\frac{0.90}{1.940} \times \frac{24.5}{27} = 0.456 \text{ PPM of HCN}$$

Test No. 2

$$\frac{0.03}{0.977} \times \frac{24.5}{27} = 0.020 \text{ PPM of HCN}$$

Test No. 3

$$\frac{0.00}{1.034} \times \frac{24.5}{27} = 0.000 \text{ PPM of HCN}$$

B. Test Methodology

Beneco Associates, Inc. report of 4/18/90
to Ponco, Inc. Cleveland, Ohio

STACK GAS FLOW AND HCM EMISSIONS

Test No.	1	2	3
Date	4/10/90	4/10/90	4/10/90
Overall sampling period	7:50 AM 9:55 AM	10:55 AM 12:25 PM	3:30 PM 5:35 PM
Net sampling time, min.	120	60	120
STACK GAS			
Temperature, deg. F	530	521	770
Flow rate:			
Actual lbs/hr	11300	12000	10100
Dry basis lbs/hr	11000	11700	9600
Acfm	4700	5200	5400
Scfm, dry	2440	2600	2100
PARTICULATE MATTER			
Concentration			
Dry Basis:			
Lbs dust per 1000000 lb gas	.417	.018	0
Grains per 1000 scf	.219	.009	0
DUST EMISSION RATE, lbs/hr	.0045B7	.0002106	0

Hemeon Associates, Inc. report of 4/19/90
to Fosseo, Inc., Cleveland, Ohio

DETERMINATION OF PARTICULATE EMISSIONS
EPA METHOD 5

The following method was used in this test program. Sampling procedures follow those described in Method 5 of the Federal Register* and Determination of Environmental Pollutants**.

SAMPLING APPARATUS

The particulate sampling train used in these tests at the exit stack met certain design specifications established by the Federal EPA and was assembled by Hemeon personnel. It consisted of:

Nozzle - Stainless steel (316) with sharp, tapered leading edge and accurately measured round opening.

Probe - Glass lined with a heating system capable of maintaining a minimum gas temperature of 250°F at the exit end during sampling.

Pitot Tube - Type S pitot tube that met all geometry standards was used to monitor stack gas velocity.

Filter Holder - Pyrex glass with heating system capable of maintaining a filter temperature of approximately 250°F.

Draft Gauge - An inclined manometer made by Dwyer with a readability of 0.01 inches H2O in the 0-1 inch range was used.

Impingers - Four impingers connected in series with glass ball joints. The first, third and fourth impingers were of the Greenburg-Smith design, modified by replacing the tip with a 1/2 inch I.D. glass tube extending to 1/2 inch from the bottom of the flask.

Metering System - Vacuum gauge, leak-free pump, thermometers capable of measuring temperature to within 5°F, calibrated dry gas meter, and related equipment, to maintain an isokinetic sampling rate and to determine sample volume. The dry gas meter is made by Rockwell and the fiber vane pump is made by Gast.

Barometer - Aneroid type to measure atmospheric pressures to ±0.1 inch Hg.

*Federal Register, CFR 40, Part 60, July 1, 1987
**E.P.A. Source Testing Manual, January 1983

Hansen Associates, Inc. report of 4/19/90
to Fenco, Inc., Cleveland, Ohio

SAMPLING PROCEDURE - PARTICULATE

After selecting the sampling site and the minimum number of traverse points, the stack pressure, temperature, moisture and range of velocity head were measured according to the procedures described in the Federal Register.

Approximately 200 grams of silica gel were weighed in a sealed impinger prior to each test. Glass fiber filters[99] (4 inch diameter) were desiccated for at least 24 hours dried at 105°C for two hours and weighed to the nearest 0.1 mg on an analytical balance. One-hundred ml of distilled water was placed in each of the first two impingers; the third impinger was initially empty; and the impinger containing the silica gel was placed next in series. The train was set up with the probe as shown in Figure A-1. The sampling train was leak-checked at the sampling site prior to each test run by plugging the inlet to the nozzle and pulling a 15 inch Hg vacuum, and at the conclusion of the test by plugging the inlet to the nozzle and pulling a vacuum equal to the highest vacuum reached during the test run.

The pitot tube and lines were leak-checked at the test site prior to and following the initial velocity traverse. The check is made by blowing into the impact opening of the pitot tube until 3 or more inches of water are recorded on the manometer and then capping the impact opening and holding it for 15 seconds to assure it was leak free. The static pressure side of the pitot tube was leak-checked using the same procedure, except suction was used to obtain the 3 inch H$_2$O manometer reading. Crushed ice was placed around the impingers to keep the temperature of the gases leaving the last impinger at 68°F or less.

During sampling, stack gas and sampling train data was recorded at each sampling point and when significant changes in stack flow conditions occurred. Isokinetic sampling rates were set throughout the sampling period with the aid of isokinetic sampling equations. All sampling data was recorded on the Particulate Field Data Sheet.

[9]Federal Register, CFR 40, Part 60, July 1, 1988
[99]Glass fiber filters, Type 934 AH

Environ Associates, Inc. report of 4/16/80
to Fosco, Inc., Cleveland, Ohio

SAMPLE RECOVERY PROCEDURE

The sampling train was moved carefully from the test site to the cleanup area. Samples of the acetone and distilled water used in the sample recovery were taken for use as blanks. The volume of water from the first three impingers were measured. Sample fractions were recovered as follows:

Container No. 1 - The filter was removed from its holder and placed in a petri dish and sealed.

Container No. 2 - Loose particulate and water washings from all sample-exposed surface prior to the filter were placed in a sample container, sealed and labeled. Particulate was removed from the probe with the aid of a brush and distilled water rinsing. The liquid level was marked after the container was sealed.

Container No. 3 - Loose particulate and acetone washings from all sample-exposed surface prior to the filter were placed in a sample container, sealed and labeled. Particulate was removed from the probe with the aid of a brush and acetone rinsing. The liquid level was marked after the container was sealed.

Container No. 4 - A minimum of 200 ml of acetone was taken for the blank analysis. The blank was obtained and treated in a similar manner as the acetone washing.

Container No. 5 - Distilled water in the impinger section of the sampling train was placed in a sample container. The impingers and connecting glassware will be rinsed with distilled H_2O and this rinse added to the container for shipment to the laboratory.

Container No. 6 - Acetone washings from all sample-exposed surfaces in the impingers were placed in a sample container, labeled and sealed. The liquid level was marked after the container was sealed.

Container No. 7 - A minimum of 200 ml of distilled water was taken for the blank analysis. The blank was obtained and treated in a similar manner as the water rinse.

The silica gel from the fourth impinger was weighed and the gain recorded on the Sample Recovery Data Sheet with other pertinent data.

ANALYTICAL PROCEDURES

The following procedures will be used and follow the methods prescribed by the Handbook of Emissions Sources:

Container No. 1 - The filter and any loose particulate matter from this sample container were placed into a tared glass weighing dish, desiccated for 24 hours to a constant weight and weighed to the nearest 0.1 mg.

Container No. 2 - The distilled water washing were transferred to a tared beaker and evaporated to dryness at 105°C temperature and pressure, desiccated for 24 hours to a constant weight and weighed to the nearest 0.1 mg.

Container No. 3 - The acetone washings were transferred to a tared beaker and evaporated to dryness at ambient temperature and pressure, desiccated for 24 hours to a constant weight and weighed to the nearest 0.1 mg.

Container No. 4 - The acetone blank was transferred to a tared beaker and evaporated to dryness at ambient temperature and pressure. The blank was then be desiccated for 24 hours to a constant weight and weighed to the nearest 0.1 mg.

Container No. 5 - The contents of this container were filtered through tared (0.6u - 0.2u) filters to remove insoluble particulate. The filters and filtrates were put in tared beakers, evaporated to dryness at 105°C, desiccated to a constant weight and weighed on an analytical balance to the nearest 0.1 mg.

Container No. 6 - The contents of this container were evaporated to dryness at ambient temperature and pressure, desiccated to a constant weight and weighed on an analytical balance to the nearest 0.1 mg.

Container No. 7 - The distilled water blank was transferred to a tared beaker and evaporated to dryness at 105°C. The blank was then desiccated to a constant weight and weighed on an analytical balance to the nearest 0.1 mg.

The term "constant weight" means a difference of no more than 0.5 mg or 1% of total weight less tare weight, whichever is greater between two consecutive readings, with no less than 6 hours of desiccation between weighings.

C. Field Data Sheets

DRY GAS METER CALIBRATION DATA FORM

Test numbers ________ Date 15 Mar 90 Meter box number RAC 2516 Plant ________

Barometric pressure, P_b = 29.27 in. Hg Dry gas meter number 24160? Pretest Y 1.009

Orifice manometer setting, (ΔH), in. H_2O	Gas volume: Wet test meter (V_w), ft^3	Gas volume: Dry gas meter (V_d), ft^3	Temperature: Wet test meter (t_w), °F	Temperature: Dry gas meter: Inlet (t_{d_i}), °F	Temperature: Dry gas meter: Outlet (t_{d_o}), °F	Temperature: Dry gas meter: Average (t_d),[a] °F	Time (Θ), min	Vacuum setting, in. Hg	Y_i	$Y_i = \frac{V_w P_b (t_d + 460)}{V_d \left(P_b + \frac{\Delta H}{13.6}\right)(t_w + 460)}$
2.0	10.020	10.555	74	125	96	110.5	[illegible]	2.4	1.009	
2.0	10.227	10.214	74	126	98	112	[illegible]	2.4	1.007	
2.0	10.226	10.249	74	127	100	113.5	[illegible]	2.4	1.006	
									Y = 1.007	

[a] If there is only one thermometer on the dry gas meter, record the temperature under t_d.

V_w = Gas volume passing through the wet test meter, ft^3.

V_d = Gas volume passing through the dry gas meter, ft^3.

t_w = Temperature of the gas in the wet test meter, °F.

t_{d_i} = Temperature of the inlet gas of the dry gas meter, °F.

t_{d_o} = Temperature of the outlet gas of the dry gas meter, °F.

t_d = Average temperature of the gas in the dry gas meter, obtained by the average of t_{d_i} and t_{d_o}, °F.

ΔH = Pressure differential across orifice, in H_2O.

Y_i = Ratio of accuracy of wet test meter to dry gas meter for each run.

Y = Average ratio of accuracy of wet test meter to dry gas meter for all three runs; tolerance = pretest Y ±0.05Y

P_b = Barometric pressure, in. Hg.

Θ = Time of calibration run, min.

Remcon Associates, Inc.
125 Thirty-Ninth Street
Pittsburgh, PA 15201

PITOT TUBE CALIBRATION DATA

Calibration pitot tube: type [illegible] size (OD) [illegible] ID number [illegible]

Type S pitot tube ID number [illegible] $C_{p(std)}$ = [illegible]

Calibration: date [illegible] performed by [illegible]

A - Side Calibration

Δp_{std} cm H_2O (in. H_2O)	Δp_s cm H_2O (in. H_2O)	a $C_{p(s)}$	b DEV.
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
	Average	[illegible]	[illegible]

B - Side Calibration

Δp_{std} cm H_2O (in. H_2O)	Δp_s cm H_2O (in. H_2O)	$C_{p(s)}$	DEV.
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
	Average	[illegible]	[illegible]

$^{a}C_{p(s)} = C_{p(std)} \sqrt{\frac{\Delta p_{std}}{\Delta p_s}}$ = [illegible]

^{b}DEV = $C_{p(s)} - \bar{C}_p$ (must be ≤0.01)

$\bar{C}_p(A) - \bar{C}_p(B)$ = [illegible] (must be ≤0.01)

[illegible], Inc.
125 Thirty-[illegible] Street
Pittsburgh, PA 15201

HEMEON ASSOCIATES, INC.
Particulate Field Data Sheet

Plant [illegible] City [illegible] Operator [illegible] Date [illegible]
Location [illegible] Test no. [illegible]
Stack dimen. [illegible] Desiccant no. [illegible] Filter no. [illegible]
Pitot coeff. [illegible] Pitot number ______ Meterbox number [illegible] Meterbox Cal.(Y) [illegible] Nozz. Diam. [illegible] Nozz. I.D. [illegible]

Trav. point no.	Velocity head (ΔP) (in.) H_2O	Gas temp. degrees F	Orifice ΔH Uncorr. in. (H_2O)	Orifice ΔH Corr. for moist. in.(H_2O)	Clock time	Sample time mins	Vacuum "Hg	Meter reading cu. ft.	Meter temperature degrees F In	Meter temperature degrees F Out	Temperature Probe	Temperature Filter box
Init	xx		xx	Factor (.85)	[illegible]	[illegible]	xx	[illegible]	xx	xx	[illegible]	
[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
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[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
Summary [illegible]		[illegible]		[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		

Ambient temp. ______ °F
Bar. Press. [illegible] in. Hg
Stat. Press. [illegible] in. WC

IMPINGER WATER
Final [illegible] ml
Init. [illegible] ml
Cond. [illegible] ml

DESICCANT
Final [illegible] gm
Init. [illegible] gm
Gain [illegible] gms

ORSAT ANALYSES

Time	[illegible]			
CO_2	[illegible]			
O_2	[illegible]			
CO				

Final leak rate [illegible] cfm at [illegible] in. Hg

REMEON ASSOCIATES, INC.

Particulate Field Data Sheet

Plant [illegible] City [illegible] Operator [illegible]

Location [illegible] Test No. [illegible] Date [illegible]

Stack diam. [illegible] Desiccant no. [illegible] Filter no. [illegible]

Pitot coeff. [illegible] Pitot no. [illegible] Pressure number [illegible] Meterbox (Cal. (Y) [illegible] Nozz. Diam. [illegible] Noz. I.D. [illegible]

Trav. point no.	Velocity Head (ΔP) (in.) H_2O	Gas temp. °F	Orifice ΔH Uncorr. in. (H_2O)	Orifice ΔH Corr. for molec. in (H_2O) Factor	Clock time	Sample time, min	Vacuum, " Hg	Meter reading cu. ft.	Meter Temperature Degrees F In	Meter Temperature Degrees F Out	Temperature Probe	Temperature Filter box	[illegible]
Init.	xx	xx	xx	([illegible])	[illegible]	[illegible]	xx	[illegible]	xx	xx	[illegible]		[illegible]
[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]
[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]
[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]
[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]
[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]
[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]
[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]
[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]
[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]
[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]
[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]
[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]

BEMON ASSOCIATES, INC.
Particulate Field Data Sheet

Plant _____ City _____ Test no. _____ Operator _____ Date _____
Location _____ Run no. _____ Filter no. _____
Stack diam. _____ Probe no. _____ Nozz. _____ Noz. _____
Pitot tube coef. _____ Pitot number _____ Meterbox number _____ Std. (Y) _____ Diam. _____ T.D. _____

Traverse point no.	Velocity head (Δp) (in.) H_2O	Stack temp. degrees F	Orifice ΔH Uncorr. in. (H_2O)	Orifice ΔH Corr. for moist. in. (H_2O)	Clock time	Sample time min	Vacuum "Hg	Meter reading cu. ft.	Meter temperature degrees F In	Meter temperature degrees F Out	Temperatures Probe	Temperatures Filter box
Init				Factor								
Summary												

Ambient temp. _____ °F
Bar. Press. _____ in. Hg
Stack Press. _____ in. Hg

IMPINGER WATER
Final _____ ml
Init. _____ ml
Cond. _____ ml

DESICCANT
Final _____ gms
Init. _____ gms
Gain _____ gms

ORSAT ANALYSES
Time
CO_2
O_2
CO
N_2

Pitot leak rate _____ cfm at _____ in. Hg

REMEON ASSOCIATES, INC.
Particulate Field Data Sheet

Plant [illegible] City [illegible] Operator [illegible]
Location [illegible] Test no. [illegible] Date [illegible]
Stack dimen. [illegible] Desiccant no. [illegible] Filter no. [illegible]
Pitot coeff. [illegible] Pitot number ______ Meterbox number [illegible] Meterbox Cal(Y) [illegible] Noz. Diam. [illegible] Noz. I.D. [illegible]

Trav. point no.	Velocity head (ΔP) (in. H_2O)	Gas temp. degrees F	Orifice ΔH Uncorr. in. (H_2O)	Orifice ΔH Corr. for weight in. (H_2O)	Clock time	Sample time min	Vacuum "Hg	Meter reading cu. ft.	Meter temperature degrees F In	Meter temperature degrees F Out	Temperature Probe	Temperature Filter box
Init	xx		xx	Factor ([illegible])	[illegible]	0	xx	[illegible]	xx	xx	[illegible]	
[illegible]	.25	[illegible]		[illegible]	[illegible]	5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
2	.25	[illegible]		[illegible]	[illegible]	10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
3	[illegible]	[illegible]		[illegible]	[illegible]	15	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
4	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
5	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
5	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
4	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
3	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
Summary	1.112	778		.748		120	[illegible]	[illegible]	[illegible]	76		

Ambient temp. ______ °F
Bar. Press [illegible] in. HG
Stat. Press [illegible] in. WC

IMPINGER WATER
Final [illegible] ml
Init. [illegible] ml
Cond. [illegible] ml

DESICCANT
Final [illegible] gms
Init. [illegible] gms
Gain [illegible] gms

ORSAT ANALYSES

Time	[illegible]		
CO_2	[illegible]		
O_2	[illegible]		
CO			

Final leak rate [illegible] cfm at [illegible] in. Hg N_2 - .785

HEMEON ASSOCIATES, INC.

Particulate Field Data Sheet

Plant [illegible] City [illegible] Operator [illegible]

Location [illegible] Test No. [illegible] Date [illegible]

Stack diam. [illegible] Desiccant no. [illegible] Filter no. [illegible]

Pitot coeff. [illegible] Pitot no. [illegible] Orifice number [illegible] Meterbox (Cal.(Y) [illegible] Nozz. Diam. [illegible] I.D. [illegible] Noz. [illegible]

Trav. point no.	Velocity Head (ΔP) (in.) H_2O	Gas comp. °F	Orifice ΔH Uncorr. in. (H_2O)	Orifice ΔH Corr. for m.f.c. in.(H_2O)	Clock time	Sample time, mins	Vacuum, " Hg	Meter reading cu. ft.	Meter Temperature Degrees F In	Meter Temperature Degrees F Out	Temperature Probe	Temperature Filter box	Temperature [illegible]
Init.	xx	xx	xx	Factor ( )	4:25	60	xx	[illegible]	xx	xx	[illegible]		[illegible]
A1	.45	224		0.30	4:30	65	4.0	[illegible]	81	69	[illegible]		[illegible]
2	.44	222		0.25	4:35	70	4.0	[illegible]	82	70	[illegible]		[illegible]
3	.45	221		0.25	4:40	75	4.0	[illegible]	81	72	[illegible]		[illegible]
4	.40	222		0.30	4:45	80	4.0	[illegible]	84	72	[illegible]		[illegible]
5	.44	222		0.40	5:00	85	4.0	[illegible]	85	72	[illegible]		[illegible]
6	.45	225		0.25	5:05	90	4.0	[illegible]	83	73	[illegible]		[illegible]
B6	.45	221		0.25	5:10	95	4.0	[illegible]	88	75	[illegible]		[illegible]
5	.45	225		0.25	5:15	100	4.0	[illegible]	87	70	[illegible]		[illegible]
4	.40	222		0.25	5:20	105	4.0	[illegible]	89	70	[illegible]		[illegible]
3	.40	223		0.25	5:25	110	4.0	[illegible]	84	74	[illegible]		[illegible]
2	.25	228		0.15	5:30	115	4.0	[illegible]	84	74	[illegible]		[illegible]
1	.25	224		0.15	[illegible]	120	4.0	[illegible]	84	73	[illegible]		[illegible]

D. Laboratory Data

SAMPLE WEIGHTS AND HCN CONCENTRATIONS

Test No.	1	2	3
Test Date	4/10/90	4/10/90	4/10/90
Impinger Solution, mg	.97	.02	0
Silica Gel, mg	0	0	0
Total HCN, mg	.97	.02	0
Sample Gas Volume scf	68.5	34.5	57.7
Sample Gas Weight, lbs	5.14	2.59	4.33
PM Conc., @/1000000 dgas	.417	.010	0
PM Conc., gr/1000 dscf	.219	.009	0

TABLE I
RESULTS ON CYANIDE ANALYSIS
HERMON ASSOCIATES, INC.
125 THIRTY-NINTH STREET
PITTSBURGH, PA. 15201
PURCHASE ORDER #2890 --FOSECO
SAMPLES RECEIVED: APRIL 11, 1990

SAMPLE I. D.	MQS LABORATORY NUMBER	SAMPLE TYPE	TOTAL VOLUME ml	TOTAL CYANIDE FOUND MILLIGRAMS
7235	53691	LIQUID	420	0.96
7236	53692	LIQUID	450	0.03
7237	53693	LIQUID	500	0.01
7238	53694	LIQUID	480	0.01
7239	53695	SILICA GEL		<0.01
7240	53696	SILICA GEL		<0.01
7241	53697	SILICA GEL		<0.01
7242	53698	SILICA GEL		<0.01

THE SAMPLES WERE ANALYZED BY SPECIFIC ION ELECTRODE.

JOB 2314